OREGON DEPARTMENT OF AGRICULTURE: Research Proposal
ODA/OAN Research Theme: Crop Improvement/Yield Increases

Title: Continued Investigations of Light and Water Needs of High-Value Nursery Plants

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Principal Investigator:
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Collaborators:
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Little Prince of Oregon: Mike Hicks, General Manager - Production

Background

In 2024, the Nackley Lab launched two research projects with the Oregon Association of Nurseries (OAN) to enhance our understanding of key factors in ornamental tree production and high-value houseplant cultivation. The first project assesses the growth, outplant success, and economics of various root-pruning containers, while the second investigates the light and water needs of high-value houseplants. In the first year, we successfully established foundational methodologies, including sourcing essential materials, building lysimeters, and developing a high-throughput method for light response curves at NWREC. Early outcomes have already provided critical insights into irrigation management and optimal growing conditions for select tropical foliage plants.

This proposal requests funds to continue and enhance these research endeavors. We aim to grow the selected tree species—birch, red maple, and oak—to larger sizes, allowing us to observe the long-term effects of different container types, including root bags, air pots, pioneer pots, and classic 1200 pots. For the tropical foliage plants, we intend to expand the range of species studied and explore how temperature variations impact growth, alongside light and water requirements.

Objectives

Continued funding is crucial to fully understand the long-term effects of container type on tree growth and viability. For high-value houseplants, expanding our research to include additional species and environmental factors like temperature will provide growers with the data needed to optimize production conditions, reduce resource use, and improve plant quality. We are requesting funds for materials to maintain the sensor-controlled irrigation systems, including repairs to a shed used for dry storage of experimental materials. Additionally, we seek to acquire a vapor pressure osmometer.

A vapor pressure osmometer is a precise instrument used to measure the osmotic potential of plant tissues, a key indicator of a plant's ability to retain water under drought conditions. This equipment works by determining the vapor pressure of a solution, allowing researchers to assess the water status of plants at the cellular level. In plant drought studies, it is particularly

valuable for measuring the turgor loss point, where plant cells begin to lose rigidity due to water deficit. Understanding this threshold helps researchers and growers assess drought tolerance, optimize irrigation practices, and select more resilient plant varieties.

Methods and Timeline

Winter – Spring 2025

- Continue generating light response curves for tropical foliage plants to expand our understanding of optimal light conditions across a broader suite of species.
- Repair and maintain sensor-controlled irrigation systems to ensure precise water management as trees grow to larger sizes.
- Purchase and install the vapor pressure osmometer, an essential tool for assessing drought tolerance, setting the stage for its use in ongoing and upcoming experiments.

Summer 2025

- Conduct ongoing physiological measurements on both trees and houseplants, including monitoring plant growth, water use efficiency, and other key health indicators.
- Begin utilizing the vapor pressure osmometer to test plant responses to drought stress, focusing on both tropical foliage plants and ornamental trees. This new capability will allow for rapid and reliable assessments of drought tolerance, a critical trait in effective irrigation management.

Autumn – Winter 2025

- Analyze collected data from both the light response and drought stress experiments.
- Compile the results into comprehensive reports to be shared with collaborating nurseries and the broader horticultural community, offering actionable insights into the interplay between light, water management, and plant health across a range of high-value ornamental species.

The Benefit to the Nursery Industry

Improving production practices will enhance plant health, increase yields, and reduce costs, while support for equipment and repairs at NWREC creates a vital space for Oregon growers to connect, learn, and showcase the excellence of their industry.

Budget	**Total**	**$24,000**
• Vapor pressure osmometer		$13,000
• Osmometer consumable supplies		$2,000
• Materials for sensor irrigation and shed repairs		$8500
• Travel (gas)		$500